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ABSTRACT

Although the United Nations, through its Working Group on Direct Broadcast Satellites, and the United States, through its Communications Satellite Act of 1962, have directed attention to satellite communication systems, a gulf exists between the available technology and the educational planners concerned with the potential use of such systems. Yet, in the developing countries, no other aspect of modern communications has so much interested the planners as the possibility of using broadcast satellites for educational purposes. India and Brazil, with large land areas, have been especially enthusiastic. Problems to be met in the developing countries include: illiteracy, shortage of vocational and technical skills, the level of agricultural skills, community development, public health, population control, national and international awareness, delivery of education to remote areas, and the need for capable teachers. Primary among the requirements for successful exploitation of satellite television is the existence of at least the beginning of an educational system and the maintenance of hardware for good transmission. An important consideration of the foreign policy of the United States should be the development of the most effective means of assisting other countries to participate in satellite programs. (MF)

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BROADCAST SATELLITES:
THEIR POTENTIAL USE FOR EDUCATIONAL PURPOSES, AND THEIR RELATIONSHIP TO INTERNATIONAL UNDERSTANDING AND COOPERATION

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B R O A D C A S T S A T E L L I T E S
THEIR POTENTIAL USE FOR EDUCATIONAL PURPOSES, AND THEIR RELATIONSHIP TO INTERNATIONAL UNDERSTANDING AND COOPERATION

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INTRODUCTION

The rapid development of satellite communication systems in recent years has resulted in wide speculation concerning a variety of potential applications.

Among the most persistent of these has been discussion of promising (or even revolutionary) opportunities for educational programming over broad geographic areas, particularly in developing countries which are striving to make accelerated progress toward the provision of adequate educational facilities for their population.

The well-conceived application of new telecommunications technology to meet both global and United States national educational needs is currently an important issue for United States policymakers. Unfortunately, some elements of this new technology are far more advanced than plans for its effective use.

Unless this applications gap is closed, through a better understanding of the relevant needs and the sociopolitical problems involved in implementation, the United States will waste an unparalleled opportunity to contribute to international understanding and the sharing of diverse cultural experience.

The matter has become of international concern in the past years. The United Nation's Committee on the Peaceful Uses of Outer Space has already established a Working Group on Direct Broadcast Satellites, which is charged with the responsibility of examining the political and other implications of direct broadcast satellites. Considerable international interest has also been generated by (i) the technical and economic success of COMSAT/INTELSAT, (ii) activity in the United Nations and several of its specialized agencies (such as UNESCO and ITU), (iii) the International Conference on the Exploration and Peaceful Uses of Outer Space held in Vienna in 1968 (with delegations from 75 countries) during which satellite communications was a major source of discussion; and (iv) numerous conferences and publications which have been avidly discussing the subject.

An interdisciplinary approach is required to bridge this existing gulf between the available technology and the educational planners concerned with the potential use of these systems. To date, little significant analysis has been accomplished concerning the sociological, economic and political advantages of such systems, nor has sufficient work been performed on the nature of the critical problem areas which would be confronted.

For example, most proposals for or examinations of the use of space communications hardly discuss the diverse problems in the programming and software aspects of educational television through satellites and we believe this is most important. While a vast amount of

literature has resulted from the stimulus provided by the enactment of the U.S. Communications Satellite Act of 1962, little of this explores sufficiently the nontechnological aspects and the range of innovative approaches that might be considered. Many of these studies deal almost exclusively with hardware configuration. Others, which discuss various international implications or opportunities, hardly reflect cognizance of the constraints born of the limitations or the character of the software which provide the framework for such applications.

In the developing countries no other use of modern communications has so much interested the planners concerned with economic and social development as the possibility of using boradcast satellites for educational purposes. In countries where there is a dearth of well-trained teachers, where schools are short of teaching aids, and where special courses or special kinds of instruction are needed, there is increasing interest in using modern communication techniques to help broaden the perspective and educational opportunities of the citizens.

The application of modern means of communications in other countries has included, for example, television and radio in schools such as those in Samoa, Niger, Colombia, and Thailand; radio in combination with rural forum groups as in India and Togo; radio and television combined with correspondence study as in Japan and Australia; and television for teacher training in a number of countries. Because it has been demonstrated that

television and radio can play a major role in all of these educational applications, the question is whether broadcast satellites for community development could not provide an improved and perhaps less expensive service over more extensive land areas and various archipelagoes and serve a far greater number of people than radio and television have supplied in the past.

It is important to recognize that the local cultural and technological environment is not always receptive to such innovations.

Before introducing space technology into the existing educational system in developing nations, the goals, characteristics, and needs of the countries, the alternatives to satellite broadcast systems, and the inputs, processes, and outputs of the proposed systems must be carefully considered.

Within these constraints and the limits of education and the availability of that technology to accomplish its job, this testimony will present an overview of the educational potential and the international considerations which we feel must be considered in the development of the U.S. foreign policy in this area.

EDUCATIONAL APPLICATIONS OF COMMUNICATION SATELLITES

The Crucial Element

It is important to recall that the basic item delivered is an audio visual (AV) message called television. The advantage of the satellite lies in its capability to deliver the AV message to remote areas and to many places at one time with a relatively favorable cost, under given circumstances.

However, when we consider the educational impact, we must consider the

critical element to be the effectiveness of the AV message and its supporting educational system and the means of delivery to be a lesser one.

The satellite delivery system itself should not be entirely lost sight of. The presence of the receiving equipment, its maintenance system, and the concept involved will have a measurable effect in introducing the concept and the skills of an advanced technology to developing areas and the successful establishment of the system would mark a given level of technological achievement gratifying and inspiring to the people.

The AV message is not limited to live television, but can make use of videotapes, films, slides, and any of the host of materials that can be transmitted. It can make use of video tape recording (VTR) and electronic video recording (EVR) methods, at both the transmitting and the receiving end, to eliminate two primary and annoying limits or problems of educational television: (i) The need for precise scheduling which turns many teachers against instructional television, and (ii) the inability of the teacher or student to stop, reverse, or delay the pace of the material for discussion or other reason. The VTR is thus a revolutionary contribution to the effectiveness of educational television and removes many of the previous objectives to it.

The international education objectives of a satellite television system include: (i) Providing of materials for the educational system and for other information systems in developing countries; (ii) improved availability and exchange of educational materials among any or all countries; (iii) communication of educational process between countries.

It should be noted that some fascinating possibilities exist in the form of international libraries with access by satellite from computer

storage. Such advances are very likely to be possible within, if not the near future, then the intermediate future. Two way education systems via the computer and computer aided instruction will eventually be possible as the capacities of the satellite increase.

However, by far the greatest need today is for the improvements of the educational system in developing nations that are possible using existing technology. It is as essential as capital and critical to the efficiency of labor in the transformation of the country to modern status. While each country will determine its own national objectives, it is agreed that certain needs are almost universal:

1. Illiteracy is a basic problem, for it forecloses most new learning. We need not develop this area except to say that in India and parts of Africa, three-fourths or more of the population is illiterate.

2. In most of the developing countries the shortage of basic vocational and technical skills sorely limit economic development.

3. Agricultural skills also have a high priority. Starvation is more frequently encountered than education.

4. Community development is important if people are to be able to help themselves.

5. Public health and sanitation are, of course, critical.

6. Population control is a vital consideration. While it may not be solved by satellite TV, the problem can be defined and attention directed to sources of help and the first steps in public information can begin.

7. National and international awareness and community of interest are frequently mentioned as objectives by the leaders of developing nations.

The approach to each of these objectives can be assisted by satellite borne TV.

Two other basic problems are:

1. The ability to reach people in need of education. In India 75 percent or more of the population live in remote villages, half of which cannot easily be reached by road.

2. Capable teachers or teaching systems are unavailable. In India 30 percent of the teachers are totally untrained and a larger percentage are untrained by western criteria.

Benefits of Educational Satellite

As a result of the improvement of education, the following benefits can be achieved:

1. Increased productivity--agricultural and industrial.

2. Easier adaptation to new skill requirements.

3. Greater potential for democratic participation.

4. Improved village and community life.

5. Alleviation of population pressure through population control and more favorable productivity per capita.

6. The educational system itself is improved through teacher training and assistance to teachers.

7. Greater acceptance of education is certainly significant--it is more graphic and can be better accepted when the message can be both seen and heard.

One of the advantages we have mentioned may need more development. A television system is a valuable trainer of teachers. The untrained teacher

can be guided through the various tasks by example and audiovisual demonstrations provided for them.

Television gives experienced teachers more materials to work with and the opportunity to devote themselves to more difficult problems as the lecture and demonstration chore is removed from their shoulders.

In either case, the result is the upgrading and support of the local instructor particularly the unsupervised instructor who is both isolated and seperated from any source of assistance.

Also we are not limited to classroom teachers. Such assistance would be available to agricultural agents and health workers and other remote areas.

Requirements for an Effective System

Additional benefits could be defined. However, there are a number of caveats, or perhaps a better word would be "requirements."

Primary among these is the need for at least the beginning of an educational system in the developing country, to exploit the advantages of satellite TV.

The delivery of hardware is all too common, too easy, and not enough. Assistance must be provided to assure that the hardware is maintained and that there is both preparation for a good transmission, sound educational utilization of it, and followup on the educational message.

Much of the effectiveness of the educational program will depend on:

1. Thorough and sensitive assessment of educational needs.

2. The development of a systematic method for developing good educational units. A procedure that can be taught to local personnel.

3. The development of an approach that considers and employs the educational system as a whole, rather than a given film, book, or teacher.

4. The ability to make better use of the new medium, that is, television, in ways that exploit its potential rather than routinely repeat the classroom.

This was true of early instructional television in the U.S. Thus the mere presentation of a teacher in front of a camera and on the screen of a TV set is perhaps less effective than the same teacher in the flesh in front of a group of students.

Many more graphic demonstrations can be presented such as moving flow charts, time lapse photography showing the development of plants, and so forth.

There is also a need to be sure that the resources and opportunities are on hand. To describe how to build a structure or feed a herd without the local availability of the needed materials is folly. To train technicians and provide skills without the opportunity to use them is even more unwise.

Dissatisfaction, unproductive mobility, and apathy are among the lesser fruits of such a policy or lack of one.

Effectiveness of Television in Developing Regions

Have such programs worked? Yes, they have. A number of developing countries have made profitable use of educational TV as have more developed countries like Italy, Japan, and France.

There is evidence to show it can be and has been an effective tool of education and development:

(a) Upgrading instruction: Niger, Samoa, Colombia

(b) Teaching teachers: Algeria, Colombia, Samoa

(c) Extending the school: Peru

(d) Literacy and fundamental education: Peru, Ivory Coast

(e) Adult education and community development: Colombia, Samoa

(f) Remedial instruction: Turkey

(g) Improvement of Secondary schools: Chile

(h) Agriculture and village development: Senegal

In general, results are encouraging.

Much to our chagrin at times, we have observed that television can teach in many ways. Not only is the systematic teaching likely to be an effective, sometimes critical, contribution to the educational system, but incidental learning conveys vocabulary, facts, attitudes, and values. Such a relization can lead to more effective programming.

We are aware that there are other problems of language differences, differences in customs and religion and great mutual distrust within countries and areas.

These obstacles have been considered and in many instances can be overcome.

Additional Requirements

I will simply take note that one of the major and needed requirements of educational telecommunications has not taken place. The satellite is an accomplished technology with steadily improving economics and the videotape and computer technology have been achieved and are moving ahead rapidly. However, educational programming and software development are a revolution waiting to happen. There is an urgent need for active research and development in this area. Educators, audiovisual specialists, psychologists, area

specialists, and sociologists constitute the teams needed to solve the problems.

INTERNATIONAL CONSIDERATIONS

In considering the application of satellite technology to such problems as establishing national television networks which can be used for educational and other purposes one must be aware of serious political, economic, and even ideological obstacles to international cooperation.

Methods for control and planning differ from country to country. Public and private ownership features of telecommunications must be reconciled before a genuine international system can be produced. Diverse national experiences, cultures, and political systems are involved.

However, it might also be noted that UNESCO in 1960 drew attention to the impossibility of bringing about universal literacy without using space communication. The need for international cooperation in telecommunications for education and cultural purposes has been continually stressed, especially by the developing countries.

Satellites by definition are multiversal. They are capable of transmitting all forms of communication--telephone, telegraph, radio, television, data, and facsimile. They may service a limited area or a vast territory, and satellite programs can be developed and operated by national, regional, or global management.

Wide international interest and concern does exist, and it is felt that in developing U.S. policy these concerns must be taken into account.

The basic principles that must guide international cooperation in the

field of space communications have been stated in the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space. A few of the relevant portions of the treaty are included since they are very important to this current discussion.

Article I forcefully states that such activities "shall be carried out for the benefit and in the interests of all countries irrespective of their degree of economic or scientific development."

Article III provides that the signatory states shall carry out such activities "in accordance with international law" while article VI states that such countries will "bear international responsibility for national activities in outer space...whether such activities are carried out by governmental agencies or by nongovernmental entities."

According to article IX conflicts are to be avoided through "appropriate international consultations."

The United States, the U.S.S.R., and certain European countries have pioneered international organizations for the transmission of television programs via space satellites. The countries of the world have been gradually drawn into these networks. The International Telecommunications Satellite Consortium was opened for signature in 1964 and well over 60 countries have joined to date. The Soviet Union's first Molniya satellite was placed in orbit in 1965, and in 1968 the U.S.S.R. announced its intention to form a new international space communications organization named INTERSPUTNIK As has been evident in recent months, during the INTELSAT renegotiations, many problems have to be resolved regarding appropriate and acceptable international management arrangements for these systems.

Satellite Communications and the United Nations

For over a decade considerable attention has been focused in the U.N. on the various earth applications which can be provided by earth orbiting and geosynchronous satellites. The General Assembly's Committee on the Peaceful Uses of Outer Space has in recent years paid increasing attention to the use of such satellites for point-to-point communications and direct broadcast purposes. The Outer Space Affairs Division in the U.N. Secretariat has played an important role in serving the needs of the committee and also in monitoring the various developments in this and related fields.

During the U.N. Conference on the Exploration and Peaceful Uses of Outer Space some 75 delegations came together in Vienna during the summer of 1968. The sessions included the presentation of a number of papers on satellite communications, while the many corridor conversations radiated a widespread interest in potential developments.

In a direct reflection of this interest the U.N. General Assembly in December 1968 created a special Working Group on Direct Broadcast Satellites at the request of its Committee on the Peaceful Uses of Outer Space. This working group was charged with the following task:

> To study and report on the technical feasibility of communication by direct broadcast from satellites and the current and forseeable developments in this field, including comparative user costs and other economic considerations, as well as the implications of such developments in the social, cultural, legal, and other areas.

The group's first meeting, which was held in February 1969, was devoted largely to technical matters. The second session, to be held in Geneva in July 1969, will deal with the social, cultural, legal, and other

implications of direct borad cast satellites.[1]

A drafting group prepared the first session report, which reviewed the technical feasibility of direct TV broadcasting from satellites and zones, reception quality, receiving equipment, and the weight and useful life of satellites. The working group noted the uncertainty regarding the development of appropriate technology as well as the selection of system combinations, cost factors, radio frequency aspects and other matters, and thus suggested that the member countries continue their studies of the design of direct broadcasting systems and conduct appropriate experiments with a view to improving the future planning and operation of such systems and to insure the optimum use of the radio-frequency spectrum. The report also recommended satellites be considered fully by the International Telecommunications Union (ITU) and that the necessary provisions be made for this service at the forthcoming ITU World Administrative Conference for Space Radiocommunications, if direct broadcasting from satellites is to be accommodated on an operational basis. The working group also stated that "international cooperation was increasingly an important factor in establishing satellite systems for direct broadcasting." The report includes three specific conclusions:

> (a) While it is considered that satellite technology has reached the stage at which it is possible to contemplate the future development of satellites capable of directing broadcasting to the public at large, direct broadcasting TV signals into existing unaugmented home-receivers on an operational basis is not foreseen for the period 1970-1985 * * *

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[1]Much of the information regarding this U.N. working group has been derived from the March 1969 edition of the U.N. Monthly Chronicle.

(b) Direct broadcasting of TV into augmented home receivers could become feasible technologically as soon as 1975. However, the cost factors for both the earth and space segments of such a system are inhibiting factors...therefore, it is most unlikely that this type of system will be ready for deployment on an operational basis until many years after the projected date of feasibility.

(c) Direct broadcast into community receivers could be close at hand. Technology currently under development might allow this in the mid-1970's. Such a system is considered to be less expensive to launch than one intended for reception directly in people's homes.

The U.N. Scientific and Technical Subcommittee on the Peaceful Uses of Outer Space has also been quite active in this field. During its sixth session in March 1969, it approved a report containing its recommendations on means of promoting wider access to the benefits of space technology for nonspace countries and particularly for the developing countries (this was one of the main themes of the 1968 U.N. Conference in Vienna). Following this lead a proposal was made for the appointment of an official, who would serve in the Outer Space Affairs Division of the U.N. Secretariat, and who would keep abreast of efforts by the U.N. family of organizations in the field of space applications (including communications) and would serve as a "point of contact" for member countries seeking information and assistance.

This subcommittee has also been seeking to encourage the United Nations Development Program (UNDP), UNESCO and other specialized agencies to assist by various methods in the promotion of the application of space technology with particular reference to nations not advanced in space research.

The Less Developed Countries and the Use of Satellite-Derived Technology

Impetus for U.N. activity in these fields has come enthusiastically

from many of the developing countries and especially from such large land-area countries as India and Brazil that are interested in the possible utilization of satellite broadcasting to reach remote areas for the purposes of educational and community development. It might further be noted that such developed countries as Canada and Australia, both with sparsely populated and scattered towns also have a direct interest in such utilization. Although many of the developed countries already have national television networks, the difficulties facing developing nations such as India to achieve such a network are formidable.

Not only do such countries have the obvious problems of evolving the necessary industrial-technological base (especially including electronics), the necessary trained personnel, and the necessary financial resources, but they are also faced with making important decisional choices between the claims of such programs as participation in space communications and other national objectives. These choices must be made, moreover, in the light of long-term national goals and expectations, since the research and development supported today may take a decade or more to achieve its aim. A recent study, for example, has indicated it would take India 20 years and an expenditure of perhaps $750 million to achieve a nationwide television system tied to satellites capable of direct boradcast--and this from a country which currently has a GNP of $37 billion and a projected increase in population during the next 20 years of 260 million people.[2]

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[2]Schramm, Wilber and Nelson, Lyle. Communication Satellites for Education and Development - The Case of India (Volume II), prepared for the Agency for International Development, Washington, D.C., August 1968.

During the first space decade the majority of developing countries participated primarily as passive spectators to the dramatic and exciting exploration of outer space. The necessary decision to refrain from active involvement was made, however, with the knowledge that the strength, progress, and prestige of countries today are measured in part by their achievements in science and technology. For the vast majority of countries whose natural resources were inadequate to support existing primary objectives, the choice of whether or not to devote a portion of those resources to the new area of outer space was simple--they could not afford to participate. Furthermore, these space programs were largely devoted either to extremely expensive manned exploration projects wildly out of the reach of these countries, or to scientific research, the results of which are made available to the world's scientific community.

However, in the middle 1960's as earth-oriented space applications programs began to multiply, the interest of those countries began to mount. In addition the developing countries have been painfully aware that the "technological gap" between developed and developing countries was growing at an exponential rate--even faster than the economic gap. Many of these countries began to feel that one method of closing this technological gap was to explore some of the less costly methods of participating in space programs. As these methods (such as sounding rockets, cooperative ground-based experiments, and participation in the operation of telemetry tracking stations) were gradually and tentatively utilized (often with the help of the United States), attention was more and more given to the possibility of developing countries participating in and deriving benefits from earthward-looking orbiting

satellites. With the onset of meteorological, navigation, and communications satellites, and especially in the forthcoming earth-resource survey satellite program in the middle 1970's, these countries are gradually becoming convinced that they can participate, that such participation will bring important national benefits, and that the expense may not be overwhelming.

EDUCATIONAL POTENTIAL AND IMPLICATIONS FOR U.S. FOREIGN POLICY

To summarize: This statement has described the potential of satellite-borne television as a transmitter of educational materials in the service of developing countries and international understanding. It is believed that with proper planning and investment, the hardware and software are available or can be delivered. It is believed even more firmly that the results that are anticipated are sorely needed by many developing countries. Many of these are of a size and have characteristics that make satellite delivery of educational materials the method of choice. Indeed, India, Indonesia, Central Africa, North Africa, and Brazil make up an incomplete list. Each is a unique situation but all have basic problems in education and great barriers to the delivery of education by conventional means.

An important consideration of U.S. policy is to develop the most effective means of assisting these countries in participating in such programs. Such a consideration should balance the frequent preference of some of these countries to deal with a regional or international organization against the relative simplicity of bilateral arrangements. It is firmly believed that policy alternatives must not be limited to narrow bilateral arrangements,

but, rather that multilateral and regional forms of participation must also be explored. The role of the U.N. and its specialized agencies can be an important one. If one of the objectives of U.S. foreign policy is to strengthen the U.N. ways and means of best utilizing that organization as a medium for enabling these countries to receive these benefits must be carefully explored.